

Interaction of nanoparticles with VUV radiation

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Nanoscience in the 21st century is thriving - nanoparticles are being studied in unprecedented detail across a broad spectrum of disciplines. Applications for the particles have been found in fields varying from medicine to computers, and the particles themselves are integral to studies ranging from spectral emissions in interstellar space to climate changes in our own environment.

Systematic studies with vacuum ultraviolet light (VUV) can contribute to the study of nanoparticle chemistry and physics in new and important ways. We have initiated a major program in the study of nanoparticles at the Chemical Dynamics Beamline at the Advanced Light Source. The project encompasses novel studies of production, detection, size measurement and selection, and chemical interactions of nanoparticles. The combination of size-selected intense particle beams and tunable VUV light affords the opportunity to study the optical and electronic properties of these ultra fine particles in regimes not accessible earlier.

Photoelectron imaging of size selected nanoparticles allows a window into probing the electronic structure of solids. We will report on these studies and discuss a novel size dependent asymmetry in the angular distributions of the emitted photoelectron. Light scattering off particles offers opportunities to measure shape and size. We will highlight our Mie scattering studies of silica particles with tunable VUV light. Finally, we will report an exciting new technique to perform mass spectrometry on fragile biological molecules with VUV single photon ionization.